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RESEARCH NOTE

A TEST OF POLLEN FEEDING BY A LINYPHIID SPIDER

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For several weeks starting in January or February each year, fallout of pine pollen forms a yellow coating on the upper surface of almost everything present in the xeric, upland habitats on the Lake Wales Ridge in south-central Florida. Juvenile orb-weavers, *Araneus diadematus* Clerck (Araneidae), and crab spiders, *Thomisus onustus* Walckenaer (Thomisidae), at high latitudes are known to greatly enhance their life expectancy in spring by feeding on pollen (Smith & Mommsen 1984; Vogelei & Greissl 1989). Hence, we reasoned that web spiders in Florida scrub might consume pine pollen adhering to their silk for added nutrition when insects typically are in short supply. We tested this idea using individually housed, female bowl and doily spiders, *Frontinella pyramitela* (Walckenaer) (Linyphiidae). We selected this spider because it is locally abundant on the Lake Wales Ridge in winter and its sheet webs become extensively coated with pine pollen.

We collected adult and subadult *F. pyramitela* (n = 36) at the Archbold Biological Station, Highlands County, Florida in February 1995 and transported them alive back to the laboratory in Missouri. We weighed the spiders to the nearest 0.01 mg and then placed them individually in cages made from recycled, 2-liter plastic carbonated beverage bottles. Each cage contained four vertical glass rods (20 cm × 4 mm o.d.) arranged in a square ~5 cm on a side to provide support for a spider's web (Fig. 1). A cage was prepared by cutting off the bottom part of a transparent bottle, embedding the rods in a 2 cm thick layer of patching plaster poured into the bottom section, and taping the capped top section back on the bottom section after the plaster was dry. Once sealed in this manner, the inexpensive bottle cage proved to be mold-free and almost airtight.

Two days after their introduction into the bottle cages at 22–26 °C under constant illumination, all spiders had spun typical sheet webs on the glass rods. On days 3, 8, and 13 we misted the contents of each cage with water sprayed through the bottle's orifice. On day 4 we assigned equal numbers of spiders (n = 12) at random to one of three treatments: Unfed, Pollen-Fed, and Fly-Fed. On days 4, 9, and 14 we uncapped the cage of each Pollen-Fed spider and manually stripped much pollen from two ripe strobili of the South Florida slash pine, *Pinus elliottii* Engelm. var. *densa* Little & Dorman, sufficient to coat the entire web. To retain nutrients, the strobili were kept frozen at −20 °C in plastic bags after collection at the Archbold Biological Station. On the same three days we fed 5–7 adult *Drosophila melanogaster* Meigen to each spider in the Fly-Fed group. On day 19, we opened every cage and re-weighed the spiders.

The initial masses of the spiders were highly uniform (Mean ± S.E.M. = 2.26 ± 0.14 mg; Coefficient of Variation = 0.0080). But at the end of the tests, spiders given a diet of fruit flies had gained an average of 2.29 ± 0.61 mg. In contrast, the Pollen-Fed spiders each had lost 0.29 ± 0.07 mg, an amount statistically equivalent to the mass lost by an Unfed spider (0.24 ± 0.0.14 mg). The Fly-Fed spiders were significantly heavier than spiders in either of the other two groups (ANOVA, F = 20.79, df = 2, $P < 0.0001$). Hence, we conclude that *F. pyramitela* did not consume pine pollen in amounts sufficient to maintain body mass. In addition, extensive observations never revealed any behavior that might suggest this spider was actively consuming

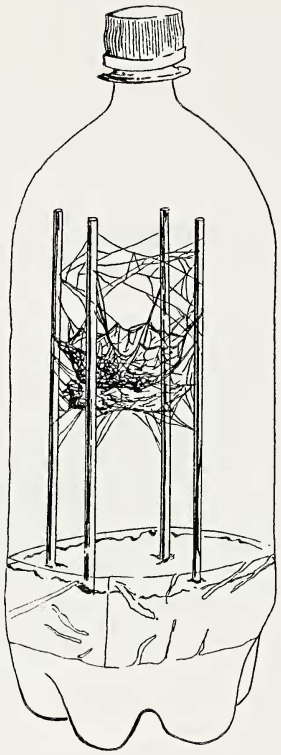

Figure 1.—Side view of the sheet web of *F. pyramitela* suspended from four glass rods inside a cage made from a transparent, 2-liter plastic, carbonated beverage "soda" bottle. The top of the bottle is held in place by wide adhesive tape. Removal of the tape allows one to have free access to the spider on its web.

pollen or removing pollen from its silk, although we often saw spiders attack fruit flies entrapped in their webs.

Pine pollen is an abundant, although short-lived resource that is known to be the preferred dietary component for the rare blister beetle, *Lytta polita* Say, which emerges in winter in south-central Florida (Carrel et al. 1990). This large insect consumes staminate *Pinus* cones, much as Americans eat corn-on-the-cob. Furthermore, chemical analysis showed that pine pollen is nearly as nutritious as pollen collected by honeybees foraging at nearby flowers (J.E. Carrel & J. Bull unpubl. data). Hence, even though bowl-and-doily spiders did not gain weight when offered pine pollen, it is likely that other species, in particular orb-weavers that ingest silk as they take down their adhesive spirals, consume pine pollen trapped in their webs.

The soda bottle cages have proven to be very suitable for long term studies of linyphiid spiders. For example, we reared several generations of *F. pyramitela* in these cages, allowing us to rapidly repeat work on web building, predation, and the pheromonal basis of courtship in this spider (Suter & Renkes 1982, 1984; Suter & Hirscheimer 1986). In addition, we now are testing the chemical basis of prey discrimination by small araneids housed in the bottle cages. Because the cages are disposable, there is no possibility of carry-over of chemical residues from test to test.

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